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ABSTRACT

Three approaches that can guide a nation's public policy with respect to graduate education and the supply of highly educated persons are discussed: manpower planning, human capital analysis, and the principle of free student choice. The first two perspectives were judged to be inappropriate and the free-choice principle endorsed. The reliance on individual decisions that follows from this principle, however, requires sound labor market information if the combined actions of students, universities, state and federal legislatures, and employers are to result in reasonably efficient outcomes: i.e., approximate balance in the supply of and demand for individuals with advanced education. The current state of the labor market forecasting techniques for doctorates was reviewed with the following conclusions: (1) Existing techniques for protecting future supply of and demand for doctorates were found to have serious limitations. (2) It was found that too few resources have been applied to the collection and analysis of information pertaining to the labor market for highly educated manpower. (3) The federal government places too much stress on the immediate state of the labor market in determining policy with respect to the support of graduate education. The report concludes with 6 recommendations designed to improve the environment for decision and policymaking with respect to graduate education. (Author)

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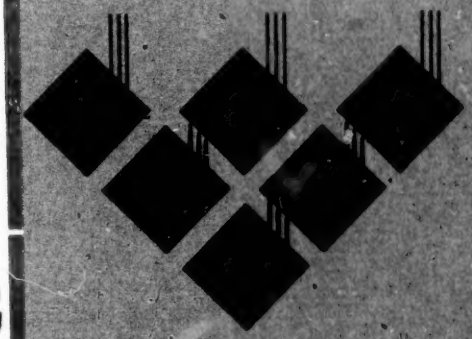

Doctorate Manpower Forecasts and Policy

A Report with Recommendations of the

NATIONAL BOARD ON GRADUATE EDUCATION

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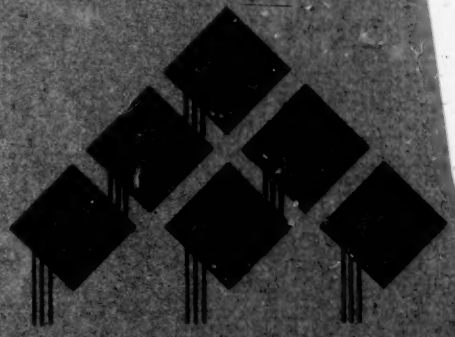

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Foreword

Following a decade of unprecedented growth, graduate education today is undergoing the difficult transition to a new environment of slower growth, changing student aspirations, reduced support, and demands for alternative curricula. The problems, questions, and opportunities associated with this process of change create the need for a critical review of the purposes and practices of graduate education. Recognizing this imperative, the Conference Board of Associated Research Councils* established the National Board on Graduate Education in 1971 to provide a means for an unbiased, thorough analysis of graduate education today and of its relation to American society in the future.

The National Board on Graduate Education (NBGE) is an autonomous body of 25 persons from the public and private sectors, chosen for their knowledge and interest in graduate education. Members were selected by the Conference Board to serve as individuals, not as representatives of constituencies. The NBGE's role is investigative and issue-oriented, with activities designed to provide a solid base of information and conceptual analysis to support its conclusions and recommendations. During its life, NBGE will focus primarily upon doctoral level education in the humanities, social and natural sciences, and engineering. (Some professional fields such as law, medicine, and theology are not included in the Board's main study.) Although major attention will be given to the doctoral degree, NBGE's concern with graduate education will encompass advanced education from the master's to the postdoctoral level, as well as new degrees, such as the Doctor of Arts.

In carrying out NBGE's charge to focus upon the problems and issues surrounding graduate education and NBGE's recommendations regarding them, the following staff activities have been defined:

* Composed of the American Council on Education, the Social Science Research Council, the American Council of Learned Societies, and the National Research Council.

1. initiation of new research studies and the encouragement of experimentation and innovation;
2. coordination and review of current research efforts and studies;
3. dissemination of bibliographic and research information and referrals for individuals, institutions, and agencies;
4. conduct of programs for the stimulation of public and professional discussion of the reports, findings, and recommendations of the Board.

In its first report (November 1972), NBGE set forth its view of the fundamental purposes of graduate education and identified the problems and concerns that would have high priority in the board's activities. First among these is a critical review and analysis of issues pertaining to the labor market for highly educated persons, since understanding of this complex topic is central to informed policy formulation for graduate education. The present report summarizes the major conclusions of NBGE and presents a number of policy recommendations for consideration.

David D. Henry, Chairman
National Board on Graduate Education

November 1973

Preface

Three approaches that can guide a nation's public policy with respect to graduate education and the supply of highly educated persons are discussed: manpower planning, human capital analysis, and the principle of free student choice. The first two perspectives were judged to be inappropriate and the free-choice principle endorsed. The reliance on individual decisions that follows from this principle, however, requires sound labor market information if the combined actions of students, universities, state and federal legislatures, and employers are to result in reasonably efficient outcomes: i.e., approximate balance in the supply of and demand for individuals with advanced education.

The current state of labor market forecasting techniques for doctorates was reviewed with the following conclusions:

1. Existing techniques for projecting future supply of and demand for doctorates were found to have serious limitations. Of the three market elements examined—future academic demand, nonacademic demand, and supply—only the projections of diminishing academic demand in the 1980's inspire much confidence. Current estimates of the size and disciplinary composition of future graduating Ph.D. classes are very uncertain, and the nature and magnitude of future nonacademic demand are poorly understood and inadequately researched.

2. It was found that too few resources have been applied to the collection and analysis of information pertaining to the labor market for highly educated manpower.

3. The federal government places too much stress on the immediate state of the labor market in determining policy with respect to the support of graduate education, resulting in stop-and-go policies that are inefficient in the long run. Policies based on short-run market conditions increase rather than dampen the cyclical fluctuations of labor markets where long training periods

are involved, and current contractionary policies may contribute to shortages of Ph.D.'s in specific fields several years hence.

The report concludes with six recommendations designed to improve the environment for decision and policy making with respect to graduate education.

David W. Breneman, Staff Director

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November 1973

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Introduction

Because the current and future state of the labor market for highly educated manpower has become of great importance to the many policy issues surrounding graduate education, the National Board on Graduate Education (NBGE) selected this subject for initial investigation from the range of topics discussed in the Board's first report.[1] The purpose of the present report is twofold: (1) to summarize the NBGE view of the issues encompassed by the topic of the projected labor market for doctoral level manpower, and (2) to present our major conclusions, together with several policy recommendations.

Although much of the labor market analysis for highly educated manpower and many of the accompanying discussions treat the subject as a purely technical one, important value-laden issues are involved. While these fundamental matters of value are often ignored in the technical papers (or inserted implicitly), sound public policy requires full and explicit treatment of both value issues and technical issues. This report considers first certain social values that are involved in manpower analysis, followed by a discussion of some of the specific technical issues of labor market forecasting; it concludes with several recommendations for public policy.

Manpower Analysis and Social Values

In a recent article entitled, "Manpower Management and Higher Educa-

[1] National Board on Graduate Education, Report of the Board, *Graduate Education: Purposes, Problems and Potential* (Washington, D.C.: National Board on Graduate Education, November 1972).

tion," [2] Howard R. Bowen poses one of the central value issues of public philosophy regarding higher education:

> A nation's system of higher education can be managed according to two basic principles: the *manpower principle*, where the objective is to produce the right number of persons for various vocations and professions, and the *free-choice principle*, where the objective is to supply education in response to the choices of students. The nations of the world differ in their relative emphasis on these two principles. In general, the socialist and developing nations stress the manpower principle. The United States throughout its history has stressed the free-choice principle. The preferences of the nations of western Europe lie somewhere between the extremes.
>
> In the United States, the free-choice principle is under attack and increasing attention is given to the manpower principle. American higher education is widely criticized for allegedly producing too many of certain kinds of manpower, especially engineers and Ph.D.'s, or for simply producing too many persons with higher education. It is often asserted that the labor market cannot absorb the numbers being educated in specific fields or all fields, that the nation should move away from the free-choice principle toward the manpower principle, and that higher education should be rationed according to manpower requirements.[3]

Bowen argues that the manpower planning approach involves several misconceptions about the functioning of our economy and manpower requirements. For example, this approach assumes that ". . . the economy requires a more or less fixed inventory of occupational skills at each stage in its evolution," and fails to recognize that the economy is highly flexible and able to adapt to different mixes of skills.[4] Furthermore, manpower planning assumes that ". . . the character of the economy and its skill requirements can be predicted for periods long enough to be pertinent to educational planning," [5] and yet the record of such planning in countries with mixed economies similar to that of the United States is one of virtual failure.[6] Bowen makes the important point that education, particularly advanced education, plays an active role in shaping the development and direction of the economy, rather than passively responding to changes in which it plays no part.

A final misconception that Bowen notes is the belief that ". . . the basic purpose of education is to prepare people for quite specific jobs; it is somehow wrong or wasteful to provide an education that will not be used directly in a vocation." [7] This point of view, with its acceptance of a one-to-one relationship between education and jobs, overlooks the versatility and flexibility

[2] Howard R. Bowen, "Manpower Management and Higher Education," *Educational Record*, Vol. 54, No. 1 (Winter 1973), pp. 5–14.
[3] *Ibid.*, p. 5.
[4] *Ibid.*, p. 6.
[5] *Ibid.*, p. 6.
[6] For discussion on this point, see Bashir Ahamad and Mark Blaug, eds., *The Practice of Manpower Forecasting* (San Francisco: Jossey-Bass, Inc., 1973), particularly pp. 310–323.
[7] Bowen, *op. cit.*, p. 9.

that well-educated people bring to the labor market, and the ability of such people to change the nature of the jobs they fill. An unrealistically static view of the economy is implied, together with the dubious belief that any education lacking immediate vocational payoffs has been wasted.

Perhaps most significant for policy purposes, however, is what is implied in the manpower planning perspective—a rationing of access to higher education. The wisdom of the nation's commitment to the free-choice principle is severely questioned by such an approach, and the resolution of this important debate will have profound consequences for the type of society which will evolve. Explicit value judgments are required, in addition to economic analyses of future labor market conditions, which by themselves are necessary but insufficient guides for public policy. Bowen's conclusions are worth considering in this regard:

> In general, these misconceptions about education and the labor market express fear of education, fear that it is expanding too rapidly or in the wrong directions. They lead to proposals to restrict the growth of education, to ration places in various programs, and, in particular, to plan the development of the educational system so that it will produce the "right" number of persons to fill a predicted number of slots in the future labor market. These restrictive proposals tend to be advocated especially for four-year colleges and for graduate and professional programs.
>
> What is needed, instead, is an educational system that continues and extends the American tradition of responding to the free choices of students. Such a system would not only accommodate students in conventional age groups but also provide ample second chances for students who may have erred in youthful decisions or who may want additional education in midcareer. The number of places in various programs and in the whole system would be set in response to student choices, not in response to dubious labor market projections.[8]

A different, although related, challenge to traditional values and attitudes toward higher education in the United States has emerged from recent economic analyses based on a "human capital" concept, developed primarily at the University of Chicago under Theodore Schultz and Gary Becker.[9] This analysis views expenditure on higher education as "investment in human capital," and it subjects such investment to rate-of-return calculations comparable to that employed in calculating the return on investments in physical capital. The rate-of-return calculations compare the private costs of higher education —foregone earnings and direct costs paid by the student—with the additional lifetime income that college graduates earn by comparison with high school graduates or that recipients of advanced degrees earn by comparison with college graduates. (This description simplifies the actual analysis, which also adjusts for differences in intelligence and other complicating factors; however,

[8] *Ibid.*, p. 11.

[9] Theodore Schultz, *The Economic Value of Education* (New York: Columbia University Press, 1963), and Gary S. Becker, *Human Capital* (New York: National Bureau of Economic Research, 1964).

toward graduate education. We believe that graduate education has facets that are ignored both by manpower planners and by human capital analysts, that *graduate education is more than investment in human capital and more than a means to train people for specific jobs,* although it includes both of these. Graduate education—like all education worthy of the name—is a process of human development for those who are capable and are motivated.[11] We support the principle of free choice for students and believe that it would be a serious error in public policy to close off opportunities to potential graduate students on the basis of a centralized manpower plan, or because the "investment" may not return the market rate of interest. Economic analysis is an important input to public policy, but efficiency is only one of the values among many that should determine public policy.

While asserting the importance of other values in supporting the free-choice principle, we also recognize that most students are deeply interested in the economic significance of a decision to enroll in graduate school. For this reason, we believe that the best possible information about future labor market conditions should be available not only to students, but also to faculty advisors, university administrators, legislators, and others whose decisions are affected by projected economic conditions. Potential graduate students will act in their own best interests—and in the interests of society—only to the degree that their decisions are based on sound information. We believe that the efficient outcomes stressed by economists can be approximated by the informed operation of the free-choice principle, although in our imperfect world, reliance on the free-choice principle will inevitably result in some inefficiency in the sense that labor markets for the highly educated will periodically experience excess supplies of, or excess demands for, particular occupational skills. Improved information and better understanding of the dynamics of such labor markets can reduce this inefficiency, but will never eliminate it entirely. We believe, however, that this is a reasonable price to pay in order to maintain the right of each citizen to choose the amount of education and type of occupation that he or she desires and is capable of attaining.

Limitations of Current Labor Market Forecasts for Doctorates

If any single issue has dominated recent discussion about graduate education, it is the abrupt reversal of the buoyant labor market for doctorates that char-

[11] A more comprehensive discussion of the NGBE view on the purposes of graduate education is contained in its first report, *Graduate Education: Purposes, Problems and Potential, op. cit.,* pp. 3–6.

acterized the late 1950's and much of the 1960's. In retrospect, it is clear that many of the current problems of graduate education discussed in our first report [12] are a result of inadequate planning during this period of growth, during which federal, state, and institutional policies were based on short-run needs only. Insufficient attention and inadequate resources were devoted to long-range planning and analysis, which are essential if major dislocations within the labor market and within universities are to be avoided. These problems are easily seen when considering the recent history and developments in the labor market for doctorates, a major university "product."

During the period of rapidly rising demand for Ph.D.'s (the late 1950's and much of the 1960's), policies were developed for support of graduate students and for the expansion of doctoral granting programs on the apparent assumption that the "boom" would never end. In a series of reports, based on an erroneous model of the academic labor market, the National Education Association warned of a continuing decline of faculty quality (as measured by the proportion of faculty members holding the Ph.D.), since the future supply of doctorates was forecast to fall far short of demand.[13] Inevitably, the "boom" ended, taking many by surprise and causing severe dislocations in the career plans of some students as well as in the developmental plans of many universities.

The obvious lesson of this recent experience is the need for improved information and analysis of the factors that affect the labor market for doctorates and a need for governmental policies which are more than short-run responses to immediate conditions, but which are based on a sophisticated understanding of the multiple-year dynamics of the doctorate labor market.[14] However, the recent abrupt shifts in federal policy toward graduate education--for example, the rapid reduction in the number of predoctoral students supported on federal fellowships and traineeships from 51,446 in Fiscal Year 1968 to an estimated 6,600 in Fiscal Year 1974—indicate that federal policy is dominated by immediate labor market concerns with little cognizance of long-run policy considerations.

The remainder of this section comments briefly upon the current state of labor market forecasts for doctorates. Much of this discussion draws upon a forthcoming technical report being prepared for the National Board on Graduate Education by Richard B. Freeman and David W. Breneman.

A dominant feature of the labor market for doctorates, as it has been dis-

[12] *Ibid.*, pp. 6–15.

[13] National Education Association, *Teacher Supply and Demand in Universities, Colleges, and Junior Colleges, 1957–58 and 1958–59*, and subsequent reports at two-year intervals through 1965 (Washington, D.C., 1959, 1961, 1963, 1965).

[14] See Richard B. Freeman, *The Market for College-Trained Manpower* (Cambridge: Harvard University Press, 1971), and David W. Breneman, *An Economic Theory of Ph.D. Production: The Case at Berkeley*, Ford Foundation Program for Research in University Administration, Paper P-8 (Berkeley: University of California, June 1970).

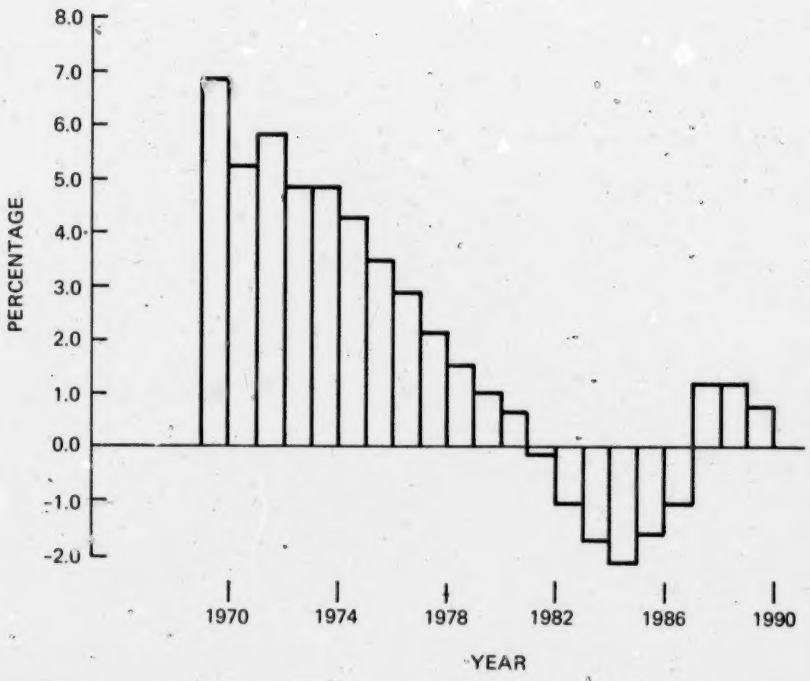

FIGURE 1 Annual percentage change in full-time equivalent enrollment in higher education, actual, 1969–1970, and projected, 1970–1990. [Carnegie Commission, *College Graduates and Jobs* (New York: McGraw-Hill, 1973).]

cussed since Allan M. Cartter's pioneering analysis,[15] is portrayed in Figures 1 and 2. Figure 1 shows the annual percentage change in full-time equivalent enrollment in higher education, actual 1969–1970, and projected 1970–1990.[16]

Demographic factors, as the chart indicates, will reduce the 5–6 percent enrollment increases of the early 1970's to less than 1 percent by 1980, with

[15] Allan M. Cartter, "A New Look at the Supply of College Teachers," *Educational Record*, Vol. 44 (Summer 1965), p. 267.

[16] *Ibid.*, p. 145.

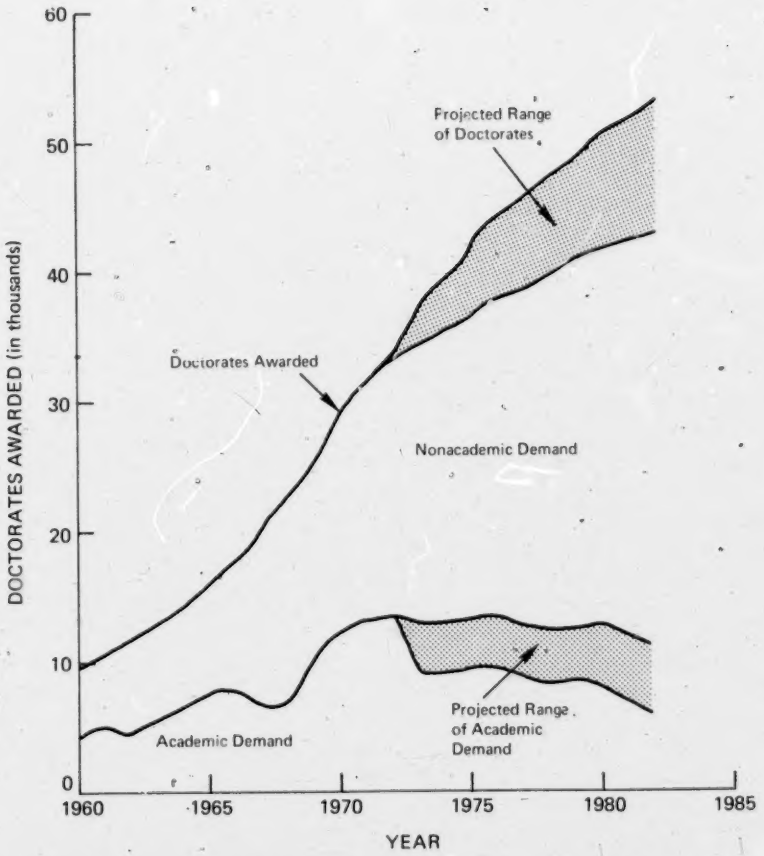

FIGURE 2 Comparison of projected doctorates awarded, academic teaching demand, and nonacademic demand. [Adapted from Carnegie Commission's *College Graduates and Jobs* (New York: McGraw-Hill, 1973)].

the possibility of an absolute decline in enrollment in the early 1980's.[17] Since approximately 50 percent of new doctorates have traditionally entered college and university employment, and since academic demand for faculty is largely a function of higher education enrollments, Figure 1 points to dramatic reduc-

[17] The Carnegie Commission has recently revised its enrollment projections to the year 2000 downward to reflect declining birth rates and the drop in college enrollment ratios of white males, among other factors. See *Priorities for Action: The Final Report of the Carnegie Commission on Higher Education* (New York: McGraw-Hill, 1973) for the Commission's recent projections.

tions in demand for new faculty by the early 1980's. When this is compared with projections of total new doctorate supply (see Figure 2) the percentage of new Ph.D.'s who must find employment in nonacademic occupations in the next decade is seen to be growing.[18]

Since the projected reduction in academic demand and the employment (or underemployment) difficulties experienced by some Ph.D.'s in recent years have become central to federal, state, university, and student reactions, it is essential to note the limitations of the analysis in Figure 2 and of the "science" of manpower forecasting in general:

1. Only academic demand for doctorates is developed analytically in Figure 2; projected nonacademic demands of industry, governments, and nonprofit institutions, and foreign demand for doctorates are not treated systematically.

2. The figure compares academic demand for doctorates with supply of doctorates, without disaggregation by discipline. Consequently, since Ph.D.'s are not perfect substitutes for one another across fields, it is probable that shortages within certain disciplines may coexist with surpluses in others. By lumping all Ph.D.'s together, shifts of graduate enrollment among disciplines are not detected, but such shifts may alter the implied future "imbalance" between supply and demand.

3. Supply projections are often simple extrapolations of past behavior, ignoring the responses of students, universities, and governments to changing market conditions. We know, however, that the publicity that surrounds projections of a declining academic labor market influences some potential doctoral students to consider alternative careers. Reductions in fellowship support increase the private cost of graduate education and thereby reduce effective demand for it. Some university faculties react by reducing the size of doctoral programs, and some programs are abandoned altogether. Table 1 provides data on trends in first-year graduate enrollments, which is consistent with this theory of market adjustments.[19] The rapid enrollment growth, which

[18] The recent downward revision of enrollment projections mentioned in the preceding footnote would imply further reduction in projected academic demand for new Ph.D.'s in the 1980's.

[19] Because we are interested in enrollment shifts among graduate programs, Table 1 includes data on first professional degree programs as well as Ph.D. programs. In addition, enrollment figures include master's degree students, since these cannot be meaningfully separated from doctoral enrollments, particularly during the first year, i.e., many doctoral candidates originally enroll in master's programs.

Two sources for more recent graduate enrollments trends are the Council of Graduate Schools–Graduate Record Examination Board annual enrollment surveys and the National Science Foundation annual surveys of *Graduate Student Support and Manpower Resources in Graduate Science Education*. These surveys are not readily comparable to nor as comprehensive as the U.S. Office of Education data in Table 1, however, because of differences in disciplinary aggregations and because they do not cover all graduate institutions nor all disciplines.

TABLE 1 First-Year Enrollment for Master's and Higher Degrees, and First-Year Enrollment for First Professional Degrees

	First-Year Enrollment						Percent Change
	1964	1966	1968	1969	1970	1971	1970–1971
First-year enrollment all fields for master's or doctoral degrees	317,808	370,772	458,334	494,363	527,834	528,151	0.1
English and literature	14,597	16,921	19,104	20,568	21,036	20,576	—2.19
Philosophy	1,776	2,123	2,079	2,134	2,276	2,099	—7.78
Foreign languages	6,482	8,633	9,713	10,137	9,794	9,089	—7.19
Physical sciences, total	16,123	16,309	16,825	16,789	17,356	16,665	—3.98
Physics	5,927	5,268	5,364	5,320	5,326	4,417	—17.07
Chemistry	6,953	7,344	7,142	7,166	7,149	6,678	—6.59
Biological sciences, total	11,821	14,200	14,875	16,285	17,245	18,042	4.62
Biochemistry	1,070	1,010	1,069	1,119	1,078	1,058	—1.85
Biology	4,121	5,085	5,687	6,798	7,238	8,385	15.85
Mathematical sciences	11,830	12,624	13,299	13,748	13,604	11,996	—11.82
Economics	4,583	4,840	5,104	5,173	5,956	5,008	—15.92
History	9,182	10,733	11,790	12,894	13,182	11,929	—9.51
Political science	3,940	5,036	5,238	6,022	6,397	6,382	—0.23
Psychology	7,673	8,459	10,645	12,200	14,262	14,754	3.45
Engineering, total	30,245	32,278	34,438	36,626	35,477	30,545	—13.90
Civil	NA	3,618	3,714	4,254	4,503	4,760	5.71
Electrical	NA	8,842	9,109	9,592	9,099	8,021	—11.85
Health professions [a]	4,587	5,414	7,140	7,522	8,270	9,993	20.83
Architecture and city planning [a]	NA	1,719	2,108	2,779	3,322	4,002	20.47
Business and commerce [a]	32,909	41,038	50,530	56,283	62,182	66,392	6.77
Education, total	106,237	125,599	170,131	180,971	191,748	192,040	0.15
First-year enrollment all fields for first professional degrees	NA	36,328	47,044	56,057	63,265	69,909	10.50
Dentistry	NA	3,295	4,285	4,354	4,639	5,103	10.00
Medicine	NA	7,906	9,843	10,832	11,394	12,946	13.62
Law	NA	19,268	25,248	30,433	36,136	40,003	10.70

[a] Adjustments for changes in taxonomy during the period were made. A detailed explanation of the method of calculation is available upon request.

Source: U.S. Office of Education, *Enrollment for Master's and Higher Degrees, Fall 1964; Students Enrolled for Advanced Degrees: Fall 1966* (and Fall 1968, Fall 1969, Fall 1970), Washington, D.C.; and preliminary figures from U.S. Office of Education on enrollment for advanced degrees, Fall 1971. Adjustments for changes in taxonomy as appropriate were made.

TABLE 2 Distribution of Doctorate Degrees Awarded in 1971, by Field

Field	No. of Degrees
Disciplines	
English and journalism	1,310
Foreign language	1,010
Psychology	1,740
Social sciences	3,960
Mathematics and statistics	1,480
Physical sciences	4,440
Biological sciences	3,540
General science	30
TOTAL	17,510
Professional fields	
Fine arts	1,120
Education	6,210
Engineering	3,820
Agriculture and forestry	940
Business	760
Health professions (other than M.D. and D.D.S.)	400
Social work	100
Library science	40
Other	1,100
TOTAL	14,490

Source: *A Fact Book on Higher Education*, fourth issue/1972, (Washington: American Council on Education, 1973), pp. 72.226 and 72.227.

lasted until the late 1960's, has since slowed considerably, and in a number of fields such as chemistry and physics where employment difficulties have been widely publicized, substantial enrollment declines have occurred. Although the magnitude of these effects operating to reduce the future supply of doctorates is not known,[20] the National Center for Educational Statistics of the U.S. Office of Education has revised its projections of new doctorate supply in 1980-1981 from 68,700 projected in 1971 to 52,000 projected in 1972,[21] a reduction of 24 percent.

4. It is often overlooked that many doctorate degrees are awarded in fields oriented to other than academic employment. For example, as Table 2 indicates, of the approximately 32,000 doctorates awarded in 1971, 45 percent are in fields that can be considered to have "professional" as contrasted to "academic" orientations.

Of course, the division of degrees in Table 2 does not correspond precisely to academic versus nonacademic employment patterns; many individuals who earn doctorates in the professional fields enter college and university teaching,

[20] Freeman, *op. cit.*, provides evidence and empirical estimates of student response to economic variables during the period of rapid growth in graduate education.

[21] U.S. Office of Education, *Projections of Educational Statistics to 1980–81, 1971 Edition* (Washington, D.C.: U.S. Government Printing Office, 1972), p. 43; and U.S. Office of Education, *Projections of Educational Statistics to 1981–82, 1972 Edition* (Washington, D.C.: U.S. Government Printing Office, 1973), pp. 58–59.

TABLE 3 Change in First-Year Graduate Enrollments

Discipline	Percent Change 1970–1971
English and literature	− 2
Philosophy	− 8
Foreign languages	− 7
Physics	−17
Chemistry	− 7
Mathematics and statistics	−12
Economics	−16
History	−10
Electrical engineering	−12

Source: U.S. Office of Education, *Students Enrolled for Advanced Degrees: Fall 1970*, (Washington, D.C.: U.S. Government Printing Office, 1971); and preliminary figures from U.S. Office of Education on enrollment for advanced degrees, Fall 1971.

and many who earn Ph.D.'s in the disciplines work for industry, government, and nonprofit institutions. Our purpose, however, is to draw attention to the great variety of disciplines, professions, and occupational orientations that are contained in the aggregate doctorate supply curve of Figure 2.

If we consider the concept of market adjustment together with changes in the composition of graduate enrollments, we see definite patterns emerging. Focusing on enrollment shifts among disciplines between 1970 and 1971, when market responses would be expected, we note the percentage reductions in first-year graduate enrollments as given in Table 3.

With some exceptions (biology and psychology) those disciplines that place a high percentage of Ph.D. graduates in academia have experienced reduction in

TABLE 4 Change in First-Year Graduate and First Professional Degree Enrollments

Discipline	Percent Change 1970–1971
Architecture and city planning	+21
Applied social sciences[a]	+14
Health professions	+21
Business and commerce	+ 7
Medicine	+14
Law	+11
Dentistry	+10

[a] This category includes disciplines considered to have an applied social science and public affairs orientation, such as public administration, social work, urban studies, foreign service, but specifically omits the "academic" disciplines of anthropology, archaeology, economics, history, geography, and political science.

Source: U.S. Office of Education, *Students Enrolled for Advanced Degrees: Fall 1970*, (Washington, D.C.: U.S. Government Printing Office, 1971); and preliminary figures from U.S. Office of Education on enrollment for advanced degrees, Fall 1971.

first-year graduate enrollments. By contrast, professional schools and graduate programs oriented toward professional or nonacademic employment have experienced continued enrollment growth (Table 4).

These data suggest that a substantial shift is occurring in the composition of graduate enrollments, which we believe to be further evidence of the market responsiveness of students and institutions. Since both the aggregate figures and distributional patterns among disciplines are affected by these developments, we do not anticipate the severe future labor market imbalances for doctorates that some analysts predict.

5. Analysis and projections of nonacademic demand for doctorates assume greater importance with the decline of the academic labor market, but such studies are few in number.[22] Unresolved methodological problems plague this area of analysis, and these difficulties are compounded by the fact that while federal government expenditures for research and development play a dominant role in nonacademic demand, the size and composition of these expenditures cannot be forecast with any certainty. Consequently, substantial ignorance surrounds this component of labor market analysis for doctorates and compounds the decision-making difficulties and planning problems that face potential graduate students, university administrators and faculty, as well as statewide planners and state legislators.

6. We have reviewed the activities and capabilities for conducting labor market studies of the many professional societies—e.g., American Institute of Physics, Modern Language Association, American Psychological Association—and have concluded that, although many of the societies collect valuable information and perform useful analyses, they lack the resources and expertise required for in-depth policy analysis. Moreover, there is a more fundamental problem that limits the value of separately focused studies on small segments of the labor market: the interdependence of labor markets for highly trained people. Although there are limits to the substitutability of Ph.D.'s across disciplines, the extensive occupational switching that does occur means that partial analyses performed by 30 or more professional societies would not aggregate to a consistent or accurate picture of the labor market. This technical problem means that more comprehensive approaches, surpassing the capabilities or interests of the individual societies, are required.

The principal conclusions of our survey of the state of labor market forecasting for doctorates can be summarized:

[22] Three sources are National Science Foundation, *1969 and 1980 Science and Engineering Doctorate Supply & Utilization*, NSF 71–20 (Washington, D.C.: U.S. Government Printing Office, May 1971); Industrial Research Institute, *Utilization of and Demand for Engineers and Scientists in Industrial Research* (New York: Industrial Research Institute, April 1973); and various research studies undertaken by the National Planning Association, Washington, D.C.

1. Of the three market phenomena we have examined—academic demand, nonacademic demand, and supply—we have substantial confidence in the forecasts of only one, constantly diminishing academic demand through the 1980's, since demographic factors dominate this analysis.[23] We consider the size and disciplinary composition of future graduating doctoral classes to be very uncertain, and the nature and magnitude of future nonacademic demand to be poorly understood. These gaps in knowledge cannot be filled by consulting the existing literature, but will require a major research effort. (The outline of one plausible approach employing an econometric model to link the relevant variables is described in the forthcoming NBGE report by Freeman and Breneman.)

2. Although this nation has made an enormous investment in graduate education, too few resources have been devoted to monitoring the system. Monitoring is needed in order to provide continuous and comparable information on trends in graduate enrollment; job placements and salaries of recent graduates; distribution of students, graduate student support funds, and research funds among fields and institutions; information on career patterns of doctorates; [24] and information on graduate enrollment trends for women and minority students. Moreover, existing information must be pieced together from disparate sources that often use different definitions, rendering comparison over time or among institutions extremely difficult. This haphazard process of data collection makes it virtually impossible to describe accurately the current state of graduate education, much less to measure the impacts of such federal policies as the recent reduction of fellowship support. If the free-choice principle that we support is to function effectively, good information is essential for students, faculty, administrators, statewide planners, and government policy makers.

3. In determining policy with respect to support of graduate education, the federal government places too much stress on the immediate state of the labor market, resulting in stop-and-go policies that are inefficient in the long run. Abrupt changes in federal policy place a heavy burden on those students whose educational career plans are suddenly altered, and on faculty, administrators, state government officials, and others concerned with the continued

[23] Although, see F. E. Balderston and Roy Radner, "Academic Demand for New Ph.D.'s, 1970–90: Its Sensitivity to Alternative Policies," Ford Foundation Research Program in University Administration, Paper P–26 (Berkeley: University of California, December 1971) for sensitivity analysis of alternative funding policies.

[24] See the Career Patterns reports of the National Research Council: National Research Council, *Profiles of Ph.D.'s in the Sciences* (Washington, D.C.: National Academy of Sciences, 1965); National Research Council, *Careers of Ph.D.'s: Academic versus Nonacademic* (Washington, D.C.: National Academy of Sciences, 1968); and National Research Council, *Mobility of Ph.D.'s: Before and After the Doctorate* (Washington, D.C.: National Academy of Sciences, 1971). Such informative reports, however, are not prepared on a continuing basis.

effectiveness of universities in performing their responsibilities for graduate education and research. Policies based on short-run market conditions increase rather than dampen the amplitude of cyclical fluctuations of labor markets where long training periods are involved, and current contractionary policies may contribute to shortages of doctorates in specific fields several years hence.

The discussion in this section explains our unease with simplistic references to a "Ph.D. glut" and associated policies that would "solve the problem" by rapid reduction in financial support for graduate education and graduate students. We believe that graduate education was worth the large investment of federal, state, philanthropic, and private funds during the past two decades, and we believe it is false economy to threaten that investment with short-run policies based upon minimal and inadequate analysis. The recommendations that follow suggest several actions that will improve the environment for decision and policy making with respect to graduate education.

Recommendations

Recommendation No. 1

Short-run, stop-and-go policies toward graduate education and research are highly destabilizing and very inefficient, whatever their origin or motivation. Abrupt shifts in federal policy can be particularly damaging, given the federal government's significant role in supporting research and graduate students.

The federal government must recognize that rapid changes in policy create serious problems for students, universities, states, and other agencies that must ameliorate insofar as possible the results of unpredictable fluctuations in federal support. Major changes in federal policy should be based upon careful evaluation of their impact and should be implemented over several years through a phased process that is coordinated with the affected states and universities.

Implementing this recommendation is virtually impossible given the present structure of the federal government, since no agency has responsibility for assessing the cumulative impact of all federal programs upon the universities. A coordinated federal policy toward graduate education and research does

not, in fact, exist. An important first step would be creation of the coordinating agency discussed below in Recommendation No. 4, but further administrative changes may be desirable. This topic will be explored in greater detail in the forthcoming NBGE report on federal policy alternatives toward graduate education.

Recommendation No. 2

Graduate education is the primary process through which research skills are developed and knowledge increased, activities that are essential to the nation's economic and cultural development. Although market demands for research and for highly educated manpower will fluctuate with the nation's priorities, it is essential that the most academically talented young people in each college graduating class are assured access to high-quality graduate education. Labor market analysis stresses *quantity* supplied and demanded, but the *quality* of that supply is of primary importance. Any public policy resulting in reduction of the growth in numbers of new doctorates must include features that ensure the continuous high quality of doctorate supply. The nation cannot afford the talent loss that would result if our most intellectually gifted citizens were denied access to graduate education.

We urge the federal government to accept responsibility for ensuring that the most academically talented young people in each college graduating class have the opportunity to attend high-quality graduate institutions. Competitive federal fellowship programs, such as the NSF predoctoral science fellowship program, should be maintained and broadened through the appropriate federal agencies to cover all academic disciplines—humanities, social sciences, life sciences, physical sciences, and engineering.

Details of this recommendation (including the suggested number of awards) will be developed more fully in a forthcoming NBGE report on graduate student financial support. Our present purpose is to argue that aggregate supply–demand considerations should not be used to eliminate all forms of federal fellowship support and to point to those areas where continuing federal support is warranted.

Recommendation No. 3

Public policy and social values, as embodied in affirmative action programs, stress the importance of increasing the numbers of minority group members and women employed in professional positions, including faculty and administrative posts in colleges and universities. It is essential that talented individuals from these groups have access to the graduate education required for high-level professional positions so that this pool of qualified people is enlarged. This suggests a further area in which policies based upon aggregate

supply–demand analysis must be modified by additional policy considerations.

The federal government and the universities should accept joint responsibility for ensuring access to, and successful completion of, graduate degree programs for minority group members. Similar responsibility should be exercised to ensure opportunities for women to enroll in graduate degree programs in fields where they have historically been underrepresented.

The NBGE will discuss in greater detail the ingredients of a positive program to ensure access to graduate education for minority group members in forthcoming reports. Financial support for minority students is a necessary, but not sufficient, component of such a program. A recent survey report sponsored by the Graduate Record Examinations Board and the Council of Graduate Schools entitled *Graduate School Programs for Minority/Disadvantaged Students* [25] discusses considerations necessary for effective recruitment to—and successful completion of—graduate programs by minority/disadvantaged students. As with Recommendation No. 2, however, one primary purpose of this recommendation is to call attention to those areas where aggregate labor market analysis is inadequate for guiding public policy toward graduate education.

Recommendation No. 4

Accurate and timely information on current labor market conditions and improved forecasts of future market requirements are essential to the efficient operation of a decentralized system of graduate education, including reliance on free student choice in determining the size and composition of graduate enrollments. Shortcomings of the existing information base and inadequacies of current forecasting techniques were documented earlier in this report. Information of this type, being a public good, must be provided by the government. Since graduate education serves a national market, with both research findings and the graduate-educated free to cross state boundaries, the federal government is the proper agent to fund and administer the necessary data collection and analysis.

Only the federal government has the capability and authority to collect consistent and comprehensive data on trends pertinent to the labor market for highly educated manpower, and we urge it to exercise this responsibility. At a minimum, these data should include enrollment trends by field and institution; trends in financial support for graduate students by field and institution; job placements and salaries of graduates, as well as analysis of unemployment and underemployment; trends in research and development expenditures, and the distribution of these expenditures by type of institution and source of funds. Continuously revised projections of the future market for the various

[25] I. Bruce Hamilton, *Graduate School Programs for Minority/Disadvantaged Students* (Princeton, New Jersey: Educational Testing Service, 1973).

types of highly trained manpower are also needed. In addition to collecting and providing such information, the federal government should encourage and support research and analytical efforts using these data, including attempts to develop systematic models that incorporate the labor market analysis for highly trained manpower within existing economic models of the national economy.

This broad recommendation involves several interlocking features. First, one agency must be assigned responsibility for coordinating the total effort, which will necessarily involve seeking information and assistance from a variety of public and private organizations. Much of the data mentioned in our recommendation is currently collected by diverse federal agencies; however, no single agency has the responsibility for coordinating and integrating these separate pieces of information into a coherent framework for policy makers. The Bureau of Labor Statistics is one potential coordinating agency; an alternative would be to develop the necessary analytical capability in a special staff reporting to the Assistant Secretary for Education, Department of Health, Education, and Welfare. Other possibilities include the Office of Management and Budget; Council of Economic Advisors; an interagency staff drawing on representatives of the NSF, NIH, NEH, and other relevant agencies; or funding of an analytical group in a nonfederal agency such as the Brookings Institution, American Council on Education, or National Academy of Sciences. We are undecided as to the most appropriate location for the coordinating agency and hope that our recommendation sparks discussion, debate, and action on this point.

Second, the coordinating agency, in conjunction with the major federal agencies and with the Office of Management and Budget, should explore the feasibility of including in the annual federal budgeting process an assessment of the manpower implications of the major components of the budget in fields that affect the demand for highly trained manpower. Although we would not want "manpower budgeting" to be turned into a rigid centralized activity or implemented by rationing enrollments, it is nonetheless true that major new federal initiatives are often undertaken without considering effects on the labor market. Analysis of the manpower implications of the federal budget would provide valuable information to the multitude of individuals and institutions whose decisions would be influenced by such information.

In addition to collecting pertinent data and disseminating analyses and information to interested users, the coordinating agency should help to identify and to support research efforts on policy issues affecting government relations with respect to graduate education. The NBGE is concerned about the dearth of solid research findings that can be drawn upon in developing policy for graduate education. The following represent just a few of the topics in need of study if sound policy is to be developed:

1. the functioning of the labor market for highly trained manpower;

2. the effects of various forms of fellowship and other financial support mechanisms on graduate student enrollments, attrition rates, and time to degree;

3. the behavior of nonprofit institutions, such as universities, to determine likely institutional responses to various policy changes,

4. the impact of different pricing policies for graduate education;

5. the regional impact of graduate universities; and

6. improved methods for assessing financial need in providing financial support for graduate students.

The coordinating agency should have inhouse research capability, but a plurality of researchers should be funded. A major goal of the coordinated effort would be to develop systematic models of the current labor market for highly trained manpower incorporating student, university, and government behavior and integrating this model of the higher education sector into existing models of the national economy. A long-range research effort of this type is necessary to improve labor market forecasts and increase understanding of the effects of various policies toward graduate education.

Recommendation No. 5

While the federal government plays a central role in supporting research and graduate students, state governments bear primary responsibility for basic institutional support of public universities. This plurality of funding sources is one of the great strengths of American graduate education, but it also creates complicated interaction effects among the funding agencies. During the 1960's, much of the expansion of graduate education was fueled by federal grants, and the reduction of federal support in the 1970's has placed a heavy burden on many states. Understandably, state legislatures and statewide planning agencies are reviewing graduate programs with an eye toward eliminating "inefficient" programs, curtailing proliferation of graduate programs, encouraging interinstitutional and regional cooperation in the sharing of resources, and seeking cost savings wherever they can be found. This activity can contribute to the health of graduate education if it is conducted with an understanding of the complexities of graduate education and with regard for justifiable claims of institutional autonomy.

In the performance of their planning duties, state governments should examine carefully the need for additional degree programs. Existing programs should be reviewed in terms of need, quality, and output. On the other hand, if graduate education is to remain viable and diverse with respect to the types of students enrolled, if it is to be available in major urban areas, and is

to serve varied markets for highly educated manpower, opportunities for new programs and new combinations of talent should remain open. New doctoral programs that simply duplicate existing programs insofar as access and objectives are concerned should not be approved in the next several years.

Two trends seem to be emerging in statewide analysis of doctoral programs. One approach, recommended by the New York State Board of Regents Commission on Doctoral Education, would establish high standards of quality for graduate education and insist that universities not meeting these standards abandon their doctoral degree programs. The other approach, recommended by several states, including California, Washington, and Kansas, would establish certain minimal measures of productivity, such as number of degrees awarded, and eliminate programs that do not meet these standards.

Whatever the approach, we believe the following guidelines should be followed:

1. A single measure of quality should not be applied to very diverse programs—programs that may be serving the needs of nontraditional students for nontraditional forms of graduate education. Multiple indicators of quality, sensibly related to different program missions, should be developed.
2. Statewide planners should resist the temptation to apply simplistic formulas to doctoral programs, such as "eliminate any program that has not produced more than two doctorates within the last two years." Such statistical measures may flag programs in need of review, but no program should be eliminated on the basis of simple statistics alone.
3. When evaluating graduate programs, planners should not attempt state-by-state labor market analyses, since the mobility of the highly educated is certain to confound such analyses. A more appropriate criterion, we believe, is assured access to graduate education for residents within the state (or within the region, through reciprocal programs).

Just as we urged the federal government not to overreact to current labor market imbalances, so we also urge state governments to take a long-run view in supporting graduate universities. The lengthy process of building excellent graduate programs can be undone very rapidly, and when these programs need to be built again, as some of them surely will, the costs will be enormous.

Recommendation No. 6

Our final recommendation focuses on a topic of intense concern to all who worry about the intellectual vitality of the nation's universities and the continued development of the academic disciplines—the impact of a prolonged period of slow (or no) growth on the age and composition of university facul-

ties. The vitality of most academic disciplines requires the continuous renewal that new Ph.D.'s bring to the university, and yet many universities are now staffed by a high proportion of tenured faculty, with relatively few retirements expected in the next decade. The nation can ill afford to lose the intellectual excitement and vigor that the brightest young professors provide on every campus.

University administrators and faculty should explore every avenue possible to ensure a continuing flow of young faculty members into academic departments. Several alternative means toward this end have been proposed, including earlier retirements, changes in tenure concepts, and reducing the proportion of undergraduate teaching that is done by graduate students. There is at present insufficient evidence and too much institutional variation to permit specific recommendations, except to call attention to the gravity of the problem in a new era of slow (or no) growth.

It is the intention of the National Board on Graduate Education to continue to explore problems and issues in graduate education related to the labor market for highly educated manpower. New information will undoubtably cause us to supplement the present analysis and recommendations in subsequent reports, but we do urge serious consideration, debate, and action on these recommendations by all who are concerned with the continued health of graduate education.